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COVER

Flying as low as 6 feet above the ground and spewing 2,4-D butyl ester of dichlorophenoxy acetic acid, this airplane is waging aerial warfare on halogeton—a weed comparatively new to the rangelands of the West and poisonous to sheep and cattle. The action is part of trials conducted by BLM and ARS in Nevada and Idaho to determine the effectiveness of aerial spraying in combating halogeton. The trials are described on page 8.

MULTIPLE RANGE USE—NEW MEXICO STYLE

by LAWRENCE J. CASEY, Forester, BLM

SALE of the largest volume of timber ever advertised by the Bureau of Land Management in New Mexico, 4,297,000 board-feet of ponderosa pine, set the stage late in 1955 for an excellent demonstration of multiple use of the Federal range.

Through the medium of the timber sale the land is to receive not only silvicultural treatment but much improved range utilization and fire control.

Pelona Mountain, elevation 9,204 feet, straddles the Continental Divide in west central New Mexico. It is located in the Magdalena Grazing District with headquarters at Socorro and embraces about 30,000 acres of public domain with some State and private lands intermingled. The 2 grazing allotments on it are parts of 2 immense cattle and sheep ranches containing close to 200 sections each. Some 3 million board-feet of timber was harvested from the east half of the mountain in 1952 and 1953.

BLM's worst New Mexico fire swept much of the western portion of Pelona Mountain in the summer of 1950 when there was unusually good grass to carry the flames. Although the damage to mature timber appeared light at first, subsequent investigation showed that more was dying each year. Fire proved to be only one of the enemies of this timber, however. Drouth, mistletoe, rot, and bark beetles have taken a heavy toll. Porcupine damage has been extensive. Windthrows were also on the increase.

The Bureau commenced presale work in June 1954, when district personnel started the difficult search for the few stone corner monuments that were to be found. Many miles of line had to be run in order to locate the boundaries of adjoining State and private lands in an area covering the greater part of a township. When sufficient control had been established on aerial photos, the drafting office prepared a planimetric map to assist the foresters with sale layout and identification of drainages. The area was divided into a north and a south logging unit. At first it was planned to sell them separately and the smaller north unit was advertised in October of 1954, amounting to about 1.2 million board-feet.

For the first time in New Mexico a BLM timber sale failed to attract any bidders. It was therefore decided to prepare the south unit for harvesting and to combine the two in a larger, more attractive sale. In subfreezing temperatures the following January marking was commenced on the south logging unit. The marking and road estimating were completed in July with the help of range management personnel and the S. & M engineer. The combined sale called for building 56 miles of roads, which in itself placed the sale in an unusual category.

During the period of advertising, three lumber companies asked to see the timber. In order to facilitate the inspection of such a large area in one day horses were obtained from the nearest rancher. Riding a 10-mile loop, the foresters were able to show the lumbermen a representative portion of the timber and road construction. Appraised at \$7 per MBF the high bid received was \$10.15 and the total revenue as \$43,614.55, a gain of 45 percent or \$13,535.55 over the appraisal.

The silvicultural treatment and monetary revenues are not the sole benefits of this timber sale by any means. Upon completion of cutting there will be a network of roads throughout the area which will give a much greater degree of fire control in a high danger area.

The roads will not only permit the range and forestry technicians to inspect the area readily but will also provide access for the grazing permittees.

Water can be hauled where ordinarily none was available.

Dirt stock tanks can be built and cattle can use some excellent Federal range that has had practically no use.

Increased use of forage by livestock will reduce the fire danger and increase the income of both the Bureau and its range users.

The timber purchaser will have a source of logs to sustain his mill for another 2 to 3 years.

Big game have multiplied sufficiently so that the State plans to abolish a game refuge in that area.

The roads being built as a consequence of the sale will also facilitate a more strategic harvest of the game crop.

End



PORCUPINE in Ponderosa pine tree. An adult porky weighs 13 to 25 pounds, has 30,000 quills.



PORKY'S DESSERT. Trunk of small pine eaten down to sapwood by porcupine. Tap root will die, leaving worthless tree.

BLM AIDS CAMPAIGN PORCUPINE

by JOHN CLARK HUNT, Forester, BLM

EAST of the Cascade Mountains in Oregon there are several million acres of pine timber, on both private and Federal lands. Fairly recently the people in these pine areas became aware that, besides fire and insects, their forest has a third formidable enemy—the slow-moving, tree-killing porcupine.

No one knows how many porcupines there are in the pine forests of Oregon or just how much damage the critter can do in his lifetime. It is common knowledge, however, that his population is enormous and that he is causing serious damage and must be controlled. With this in mind, a campaign has been organized against the porky. The cry is "clean and oil your shooting iron, pardner. There is a lot of shooting to be done."

Good prizes are being offered for the man or boy who can account for the greatest number of the prickly animals. A hot contest has developed between Harney and Grant counties. Prizes have already been awarded in Lake county and there the campaign is starting on its second year.

The agricultural committee of the Poison Creek Grange at Burns is the strategist behind the porcupine war in Harney County and has prepared the contest rules for competition within two age groups, those over 18 years and those under 18 years of age. The contest began January 1, closes December 3, 1956, limited to residents of Harney County. Proof that a porky has bit the dust is to bring in his nose with both nostrils and a strip of hide. Checking station for porcupine noses is the county agent's office.

Cooperating are all Federal agencies in the pine area, the Bureau of Land Management with stands of timber on the public domain lands, the United States Forest Service with a large acreage within the several national forests, and the Fish and Wildlife Service with predatory animal control agents in some central and eastern Oregon counties. The Fish and Wildlife Service men are acting as technical advisors in the porcupine control program, particularly the use of poison blocks to make sure that the poison is placed in porcupine

dens and nailed in porcupine rest trees in a manner which will prevent killing of livestock and wildlife. Lumber companies and timber land owners are also joining in the campaign.

Sentiment has often been expressed, however, that it is not a united effort to wipe out the porcupine in Oregon. It is, instead, a measure to reduce his number in the areas where the large rodent has damaged or killed from 10 to 90 percent of the young pines.

Along the highway from Burns north to John Day, some 70 miles, one must look closely to find a small pine which does not show damage. The number of dead trees, dead topped and bushy topped trees which will never produce a commercial log but which are now occupying space that should be filled by healthy trees is of keen concern to the large segment of people in eastern Oregon who make their living from timber.

Porcupines also are causing damage to farmers and the producers of livestock. The porcupines feed on trees during the winter but during the summer and fall they raid gardens, truck farms, orchards, grain and alfalfa fields. Livestock and big game animals are often seriously injured by a run-in with a porcupine. The needle-sharp barbed quills of the rodent sometimes cause the muzzle and tongue of cows, horses or deer to become so swollen and painful that the animal starves to death. The adult porcupine has approximately 30,000 quills which cover the top of his body from tip of the heavy, stubby tail to the top of his head.

The old story that the porky can throw his quills is pure folklore and the idea that he is protected by game laws so that a starving man can kill him with a club for food is also folklore. He was never protected by game laws.

The meat of the porcupine is edible and tasty. Ed Zaidlicz, a BLM forester at Portland, recently broiled one and passed the meat around to his fellow workers. Zaidlicz used the following recipe: Prepare the porcupine by skinning and drawing. Soak in salted water overnight. Bring water to a boil. Pour off water. Place porcupine in cold water to which add one tablespoon black pepper and one tablespoon baking soda. Bring to a boil. Pour off water.

Porcupine

- 1 bunch celery leaves
- 3 cups cold water
- 1 onion
- 1/8 teaspoon black pepper
- 1 teaspoon salt

Put all these ingredients in a Dutch oven. Cover and cook until tender or for about 2 hours.

One Fish and Wildlife Service official said that porcupines are found in all eastern Oregon counties, are numerous in most of the counties, including Jackson, Josephine, and Klamath, of southern Oregon.

So, grab your gun, pardner, and let's head for the pine timber. The porcupine war has started.

End



AIM OF DRIVE. BLM Forester Richard Ulrich, Burns, Oreg., competes with other foresters in private contest.



DAYTIME RETREAT. FWS Trapper Sam Shaver prepares to push strychnine block wired to pole deep into porcupine den.

EXAMINE DEN. BLM Forester Dick Schroeder and Sam Shaver trace porcupine to daytime shelter.



MORE THAN BOUNDARY LINES

by WILLIAM D. PATTISON

(Mr. Pattison is a graduate of the University of Chicago with an M. A. degree in geography. He has taught historical geography at University College London, London, England and is currently working on a Doctor's thesis on the early history of the public land surveys.)

TWO DAYS after Christmas, in 1785, Thomas Hutchins wrote to the President of the Continental Congress, "Sir, accompanying these few lines your Excellency will receive a plan and remarks of that part of the Western Territory through which an East and West Line has been run."

Hutchins, in charge of the first United States public land surveys, was establishing a precedent, obedient to his instructions from Congress. In his plan and remarks, he reported not simply on a line, but on the country through which the line ran. Having advanced only 4 miles westward from the intersection of the Pennsylvania boundary with the Ohio River, he covered 8 closely written pages in describing the slopes, soil, trees and even medicinal herbs along the way. Later public land surveyors perhaps never matched this record, but they regularly followed Hutchins' precedent to a limited extent by including field observations in their returns.

This eye-witness information appears as an "added attraction" in both of the 2 basic kinds of survey record; notes, whose main purpose is to identify corners along township and section lines, and plats at a scale of 2 inches to the mile, each showing the surveyed lines and corners within a township. These records contain a wide range of observations, as any reader of this article may verify for himself. Copies of the plats and notes may be found in county courthouses, state capitals, and offices of the Bureau of Land Management. The notes, for example, contain judgments on soil quality, remarks on the lay of the land, descriptions of vegetation, and information on streams crossed by the surveyors. The plats, while less informative, usually show streams and lakes and sometimes the extent of prairie and swampland. In general, the more recent the records the more exact is their descriptive content.



It is well known that surveyors have been constant users of the plats and notes. County surveyors throughout the 29 public land States have found in them the foundation of their work. Surveyors for the General Land Office and its successor, the Bureau of Land Management, have been guided by the original records in restoring lost corners. Field engineers, verifying township and section lines for representation on topographic maps of the Geologic Survey, have consulted the same sources. Intent upon the determination of boundaries, these workers have used information on the lay of the land, trees, and other features as supporting evidence. For them, the descriptive content of the records has been a means to an end.

Through the years, however, boundary-seekers have not been alone in attending to the plats and notes. The descriptions to be found there have commanded a wide and varied audience whose primary interest has been in the countries surveyed. It is with these persons that this article is concerned.

Looking back over the history of westward expansion, we find settlers and other land buyers at the head of the list of those who profited from descriptions in the plats and notes. For over a hundred years, the public land surveys were for them the most important single source of information on newly opened lands. Prospective land buyers who could not inspect the records at surveyor generals' offices could turn to published maps which were based on the surveyors' returns. These often appeared in emigrants' guides. Private map publishers were major users of the plats and notes throughout the nineteenth century, and their state maps commonly displayed as a selling point some such notice as the following:

Compiled from the

UNITED STATES SURVEYS

Exhibiting the sections and fractional sections

Government mapping also relied upon the surveys. For example, the first accurately organized map of the United States west of the Mississippi, published by the War Department in the 1850's,

was indebted to this source. What has been called "the most American of maps," the General Land Office wall map of the United States, rapidly became the best known map based on public land survey data after its first appearance in the 1880's. In the interests of accuracy, it should be pointed out that both the government and private publishers valued the surveys as much for the grid they established as for the descriptive material they supplied.

Today, with our air photographs, soil surveys and topographic maps, it is difficult to appreciate this past importance of the plats and notes. We are brought closer to such an appreciation by reading the words of a surveyor general in Dubuque, Iowa, who wrote concerning northern Wisconsin in the 1840's, "We are now very much in the dark in regard to the general character of that section of the country; we are very much in need of that full and certain information which can only be derived from the surveyors in the service of the Government." To quote again, a celebrated orator of the same period pointed with pride to the fact that by means of the plats "the superficies of half a continent are transferred in miniature to the bureaus in Washington." Official exploring expeditions and even geological surveys were already contributing to a knowledge of western lands by this time, but the single agency which would consistently keep abreast of the advancing frontier for decades yet to come was the General Land Office, with its public land surveys.

At some time around 1900 the general significance of the notes and plats began to change. Of course, they remained, as they are today, the ultimate authority on the location of the original survey corners, but with respect to their extra descriptive content they began to lose their old utility and to assume a new kind of importance. More technical and thorough kinds of mapping were becoming widespread, and in any event a vast quantity of the plats and notes were no longer applicable to contemporary conditions, since settlement had radically altered the face of a country which they once adequately portrayed. But the out-moded plats and notes began to be appreciated as a means of finding out about past conditions otherwise beyond recall.

They had become valuable as historical documents.

One of the first persons to exploit the survey records for historical purposes was a professor of botany, Charles A. Davis, who in 1906 published a map showing the original forests of the upper peninsula of Michigan. Many researchers since that time, realizing that knowledge of past forest cover can contribute to wise present land use, have found in the survey notes a rich store of data, including the positions, diameters, and species of trees used in identifying corners. On the basis of the notes and plats, maps of original forests have been prepared with varying thoroughness for Ohio, Michigan, Wisconsin, Iowa, and Oklahoma.

Other researchers have been interested in such lost features of the American landscape as old trails. The forests, plains and mountains of our country were once criss-crossed with trails which through disuse or intermixture with later roads have lost their identity. Since the history of our country would be incomplete without a knowledge of early routes of trade and emigration, scholars have sought to trace them out on maps, through field observation and other means. Fortunately, the public land surveyors often noted the intersection of their lines with trails, and hence their records have been found especially helpful. On the basis of the notes and plats alone, a maze of Indian trails covering the state of Michigan has been mapped by an archeologist, W. B. Hinsdale. Perhaps the most impressive recovery of trails once used by westward trekking pioneers was accomplished by an historian, A. B. Hulbert, who mapped over 9,000 miles of trails west of the Mississippi after examining over 2,700 township plats.

Many other interesting details of the past have been brought to light through close examination of the plats and notes. Indian burial mounds later reduced by the plow, swamps later drained, and sites of Spanish or French occupation later engulfed by American settlement are among the features about which information has been found in the surveyors' records by persons engaged in historical research.

Purely historical research, however, has not equaled in volume the special searches made in connection with cases at law, where the status of lands at the time of survey has been in dispute. Up until recently, these cases for the most part involved submerged lands and mineral lands, but in the last few years an important new category of cases has arisen. Under the Indian Claims Act of 1946, tribes have been allowed to sue the federal government, claiming insufficient compensation at the time of surrendering their lands to the United States. The public land surveyors, of course, were normally on the scene soon after each Indian cession, making ready for white pioneers. Their records are among the best sources available for establishing the value of these Indian lands at the time in question. Accordingly, the plats and notes are in constant demand today by representatives of the suing tribes on the one hand, and by the Department of Justice on the other.

Since the days of Thomas Hutchins the public land survey records have found many uses in a changing world. Considering that their principal purpose has always been simply to show the positions of lines and corners, the utility of their supplementary descriptive content is noteworthy. From the foregoing paragraphs it should be apparent that we must regard the public land surveyors not only as the original subdividers of the greater part of our country, but as important contributors of information for the free use of the American people, and authentic adjunct of the historian.

End

WINGS AGAINST HALOGETON

by ERNEST J. PALMER, Range Conservationist, BLM

WHILE it is too early for definite conclusions, it appears that weed-killing sprays can be effectively applied to halogeton by aircraft—a technique that may offer good possibilities in fighting large isolated spot infestations too rough for ground rigs and right-of-way infestations that extend for considerable distances.

Aerial spraying trials in Nevada and Idaho so indicate.

Agricultural Research Service and the Bureau of Land Management cooperated in the experiments to determine whether applying herbicides from low-flying airplanes is practical.

Three tracts of land north of Wells, Nev., and 14.3 miles of highway right of way west of Idaho Falls were the test areas.

The treated areas in Nevada consisted of 3 plots of 100 acres each located approximately 45 miles north of Wells, Nev., and about a quarter mile off U. S. Highway 93. The elevation is approximately 6,000 feet and the topography of the land is quite rolling and hilly.

The Idaho treated area is located 32 miles west

of Idaho Falls on Highway No. 20 and extends 12.3 miles west to the junction of the Highway Nos. 20 and 26 and then 2.7 miles south along highway 26. The elevation is roughly 5,000 feet and the topography is comparatively flat.

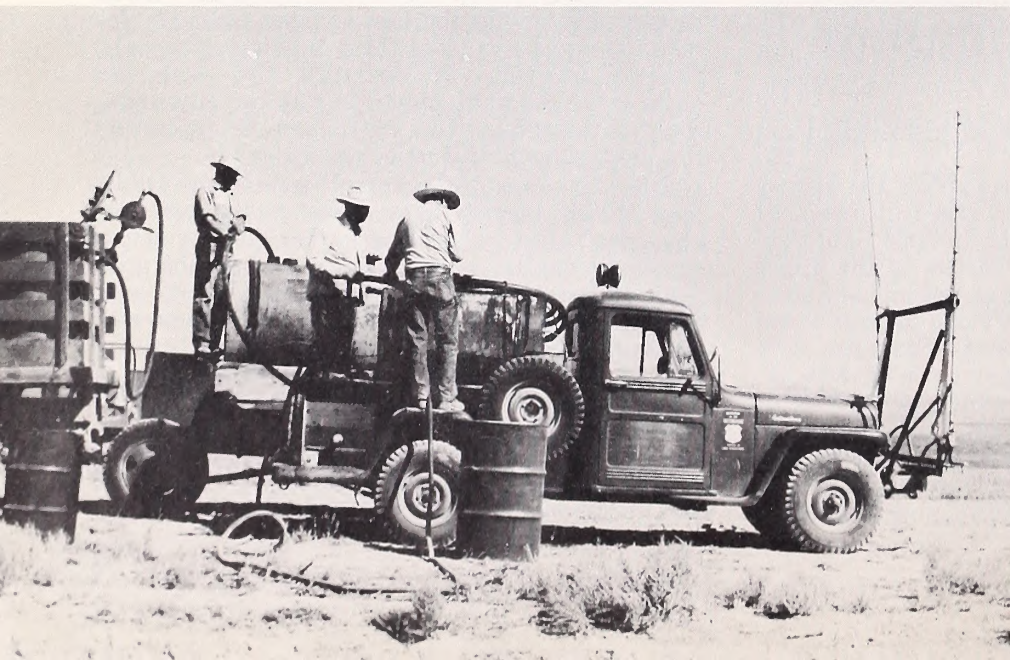
Halogeton at both the Idaho and Nevada areas was in the rosette, cruciform or early branching stage of growth which is the ideal time for spraying. Plants ranged in height from 1 to 4 inches. Halogeton density in Nevada ranged from medium (10 to 25 percent ground cover) to heavy (over 25 percent ground cover). The average density would be "high medium" to "low heavy." The halogeton density in the Idaho treated area was light or scattered.

Formulations of 2,4-D were the most successful herbicides used in both trials.

The weather conditions were favorable for both plant growth and application of the herbicides. The weather was clear and warm. The early morning hours were rather cold but it warmed up by 8 or 9 o'clock, the temperatures ranging from 46° to 75° Fahrenheit. Winds increased to

MIXING THE SPRAY. The formulations used in aerial spraying trials are prepared in portable tank for transportation to spray plane.

SPRAY LOAD. ARS plane, equipped with, takes on "ammunition" for next "strafing."



about 10 m. p. h. by 10 each morning and operations were discontinued in order to avoid bad distribution of the chemical. No precipitation was received during spraying or at least 2 weeks after treatment. In Nevada, several showers occurred during the third and fourth weeks after treatment which caused germination of viable halogeton seed in the top three-quarter inch layer of soil.

Prior to treatment in Nevada, three 100-foot line transects were laid out in each 100-acre plot and placed in diagonal corners and in the center of each plot for sampling spraying patterns and measuring results. At each 20-foot interval along the transects, 1 square foot of the vegetation was counted and photographed. Readings were made before and after treatment. The spray pattern was determined by placing a 50-foot strip of the best quality adding-machine tape on the ground and staking it down. This tape was placed at right angles to the line of flight and near each transect. Three strips of tape were used in each 100-acre plot. After treatment, the tapes were picked up and filed. After the paper was dried and later moistened the spots of oil stood out showing the spraying pattern clearly. The distribution of the chemical in the Nevada trials seemed to be very uniform and entirely satisfactory.

In Idaho, due to the scattered condition of plants, it was decided to select 10 typical 2-foot square test plot areas. Chemically treated cards were placed along each flight strip and by each of the sample stations to determine uniformity of the spray pattern. Counts of all vegetation in one square foot in each sample station were made before and after treatment.

In both the Idaho and Nevada trials, chemicals were applied from a two-place Piper Cub. The plane was equipped with a six-nozzle boom, a pro-

PELLER-driven motor for regulating pressure, and a spray tank mounted inside the plane. Ground equipment used to mix the solution and load the plane was the standard BLM jeep-mounted spray rig. The rig is equipped with a motor-driven agitator and a meter. The meter was used for each loading of the plane in order to measure exactly the 56 gallons of solution which was the capacity of the plane. A four-wheeled trailer was used for storage of diesel oil and fire pumper units were used for the transportation and storage of water. The 2,4-D was hauled to the scene of operations in drums on a 2½-ton stake truck. The motor-driven truck on the spray rig was used to transfer carriers to the mixing tank.

Personnel used in the operations included three men at the mixing and loading point, two flag men, one at each end of the swath, and the pilot of the plane. Several other persons were present during the operations mainly as observers but several of these people assisted at times.

The entire operation, including a complete round trip of the plane, averaged about 16 minutes. Each load of solution treated 8 acres, thus an average of 2 minutes was required to treat each acre.

Both the Nevada and Idaho operations went smoothly.

The chemical solution was applied at an average height of 6 to 8 feet above the ground. Each spray swath was 33 feet wide. The chemicals were applied to the treated areas in Nevada on June 19, 20, and 21. The initial aerial spraying in Idaho was done on June 27 and 28.

In Nevada, a formulation of the butyl ester of dichlorophenoxy acetic acid containing four pounds acid equivalent per gallon was used as the herbicide. The following formulations were used: (1) Straight diesel oil nothing added, 7 gallons;

(Continued on page 11)

56-gallon tank and 6-nozzle boom,



33-FOOT SWATH. Head-on view of low-flying Piper Cub as it douses halogeton-infested public lands with plant-killing 2,4-D chemicals.





active acres

ISRAEL EMULATES U. S. RANGE CODE

David Schley, Head, Range Management Branch, Soil Conservation Division of Israel, who spent considerable time with Bureau of Land Management officials in the West during the past year, has written some interesting comments on the range management program in Israel. Mr. Schley was a participant in the technical exchange program sponsored by the International Cooperation Administration of the State Department.

He reports that a range code is being put in final form and will probably be adopted shortly. John Killough of area 3, who recently completed a 2-year assignment in Israel, drafted the code which was reviewed by an Israel interdepartmental committee. The United States range code was the basis for the Israel code. The interdepartmental committee's revisions have been directed toward gearing it to local conditions.

A range survey which was undertaken during the past 2 years in Israel is being completed. Use has been made of the survey in determining initial range allotments. As allotments are completed, the boundaries are being fenced. This survey incorporates many ideas from the BLM range surveys.

With the acceptance of these two important operations, the range code and the survey, Mr. Schley and other Israel Government officials are setting up a series of planning studies for the proper use of the range. Palmer Schiele of area 2 also cooperated on the range land improvement program in Israel.

Mr. Schley also reports that the Israel Society of Range Management held its semiannual meeting at the Rehovot experiment station. The meeting was devoted to the problem of reseeding and the papers presented included a variety of subjects, such as: "Some Physiological Properties of Perennial Grass Seed," "Four Years of Reseeding in Israel," and "The Range Improvement Program of Daliah." The meetings were interesting and attended by 60 farmers, research personnel, and range technicians.

BLM TRAINING CONFERENCES

Almost every major official and supervisor from all organizational levels in the Bureau of Land Management attended at least 1 of a series of 4 weekly Management Development Conferences conducted under the direction of the Bureau's Training Officer, Roland A. Rush, in Idaho and Utah.

The purpose of the meetings was to improve supervisory skills, exchange ideas concerning methods of operation, and learn additional management techniques.

BLM Director Edward Woolley emphasized at the opening session that these conferences, unique in Bureau history, are an important aspect of an expanded training program which stems in part from the expressed interest of the President and the Secretary in employee development.

Conferee participation was stressed in the planning stages and at the sessions. Although some guest speakers well qualified in their fields addressed the conferences, the major role was played by the approximately 200 BLM employees attending. Each actively participated in the program by speaking, taking part in round-table discussions, or giving a daily oral summary to the conference. Training techniques used at the conferences included the presentation and discussion of case problems, panel discussions, visual aids, and meetings of small work-study groups which permitted even wider conferee participation.

A debate on the effectiveness of the Bureau's new promotion plan highlighted one session. It is expected that as a result of the conferences, employees attending will be more effective supervisors and will give more attention to the development of their subordinates. Conferees were asked to brief their fellow employees on conference events when they returned to their offices.

The plan of the conferences called for a six-months follow-up to assess the value and benefit of the training sessions. Each participant has been asked for a June 1956 appraisal of ways in which things learned at the conference have been useful in his job.

NEW AID TO REFORESTATION

The Bureau of Land Management is not a research organization but actively supports and relies on research conducted by others, e. g., the halogeton aerial spraying tests described in this issue. Here is another instance.

Keith T. Henson, a graduate assistant, Agricultural Engineering Department of Oregon State College; Lee O. Hunt, a forester of the Bureau of Land Management; and R. N. Lunde, a professor in the Agricultural Engineering Department of Oregon State College, give an excellent explanation of the reforestation situation in the Pacific Northwest and what the BLM and Oregon State College are doing about it in a technical paper entitled, "A Forest Tree Seed Broadcaster." Following are some excerpts:

"Historically reforestation in the Pacific Northwest has received, until lately, little emphasis. Economic factors have contributed to this. It was more profitable to purchase more timber lands than to replant. The pressing needs of war and prosperity have demanded a new evaluation of the timber supply and with it has come a realization that the forest resource is not inexhaustible. Rising prices and keen competition for limited Federally owned stumpage is rapidly creating an economic as well as conservative demand for reforestation.

"Limited supplies of planting stock make studies of direct seeding both desirable and necessary. Oregon State College is cooperating with the BLM in developing a small, hand-operated tree seed broadcasting machine to be used as a tool for direct seeding on small clear-cut areas.

"Under a Memorandum of Understanding between the Bureau of Land Management and Oregon State College, funds were provided through the Oregon State College Agricultural Experiment Station for a graduate research assistantship. The project title was designated 'The Design and Development of a Tree Seed Broadcaster and Spotting Tool.'

"After studying the original 'Cyclone' seeder, it was decided to begin from scratch and design a new seeder rather than to attempt to modify the original. The emphasis was placed on new, longer wearing materials of light weight and upon an accurate, dependable seed metering device.

"The basic operating principles of the new seeder are similar to those of the 'Cyclone' seeder.

"The most important single component of the seeder is the seed metering device. After trying several approaches to the problem, a modified version of a commercial grass seeding meter was used. It is of the fluted-wheel type commonly found on standard grain drills. The metering device chosen was made by Allis-Chalmers Equipment Corp. for use on their new version of the grassland drill.

"By means of a small chain and suitable sprockets the metering device is driven from the gear train. No controls for starting and stopping

the flow of seed are necessary since, when the fluted wheel is not in motion, no seed can be carried from the hopper to the spreader fan. As soon as the operator turns the crank, the fluted wheel begins to carry the seed and drops it on the spreader fan. Conversely, when the operator stops turning the crank, the flow of seed ceases.

"The fluted wheel in the metering mechanism is driven with a square shaft upon which the fluted wheel is free to slide. Adjustment for various seeding rates is accomplished by moving the fluted wheel along the square shaft thus exposing differing lengths of the wheel within the hopper as desired. The adjustments are made by turning a nut along the threaded end of the square shaft. A series of marks along the shaft indicate how far to turn the adjusting nut to obtain any desired seeding rate. This provides a positive adjustment and, more important, a reproducible adjustment.

"When evaluating a machine of this kind it must be kept in mind that, in the final analysis, the accuracy and uniformity of seeding is not only a function of the seeding machine, but is also dependent upon the skill of the operator, the characteristics of the terrain, the weather and the uniformity and cleanliness of the seed."—V. A. T.

End

WINGS AGAINST HALOGETON

(Continued from page 9)

(2) 2 pounds (two quarts) of 2,4-D to 6½ gallons of solution (the solution having a proportion of 98 gallons of water and 2 gallons of summer oil);
(3) 2 pounds (two quarts) of 2,4-D solution to 7 gallons of diesel oil.

These formulas were applied at a rate of 7 gallons of mixture per acre. This rate resulted in approximately 2 pounds of active ingredients of 2,4-D being applied per acre except when diesel oil was used alone.

In the Idaho trials the butyl ester of 2,4-D (4-pound acid equivalent per gallon) was applied at the rate of 2 pounds of acid equivalent per acre and 7 gallons of total solution. Water and an emulsifier were used to make the 7 gallons of emulsion.

The aerial spraying results are interesting. The Nevada treatments were as follows: *Straight oil treatment (Formula No. 1)*. Before—Total live halogeton plants—all stations—3 transects=2,036. After—Total live halogeton plants—all stations—3 transects=853. The diesel oil without 2,4-D gave unsatisfactory kills of halogeton and had no noticeable effect on the rabbit brush, sage brush, and crested wheat grass.

Water-oil emulsion treatment (Formula No. 2). Before—Total live halogeton plants all stations—3 transects=1,433. After—Total live halogeton plants—all stations—3 transects=7. The kill of halogeton with this formula was actually 100 percent. The seven plants found on the transects were

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TRAIL OF THE TRANSIT

by ROBERT S. HALLIDAY

(Special permission of
Salt Lake Tribune, Salt Lake City, Utah)

ANDREW NELSON has followed the straight and narrow for half a century. It's taken him through deserts so hot the thermometers burst like popcorn, into winter wilds, cold enough at 50 below to quick-freeze human lungs.

The Salt Laker has shot rock-studded rapids in a birch-bark canoe and won a snowshoe race with death.

Ignoring even the comparative safety of game trails in his pursuit, he never deviates from a straight-line course—across gorges, over peaks, through tangled forests of some of the wildest terrain in America.

His goal? To mark off the western United States in neat little 1-mile squares. He's been at it since 1904 and shows no sign of slowing up.

Mr. Nelson of 1121 Yale Avenue (1085 South St.), Salt Lake City, is dean of Federal (Bureau of Land Management) surveyors. He has surveyed the boundaries of approximately 7 million acres, linear surveys which, end to end, would more than encircle the globe.

"And for every mile surveyed we generally have to walk 5," he said, "particularly in rough country."

On several occasions he has walked 45 miles in a day. And being only 5 feet 5½ inches tall, he has to "take 2 steps to the other fellow's 1."

During a lull in the job of surveying the Arizona Strip in 1911, he hiked from the north rim of Grand Canyon to the south rim just for exercise. He covered the 22-mile mountain goat trail through the famous 6,350-foot gully in 8 hours, 45 minutes, the third man in history to make the trip afoot in a day.

He has traveled by snowshoes, skis, canoes, horses, mules, and trucks. In the old days, it was all in a day's work to ride 60 miles astride a horse or mule.

There are all kinds of transitmen, but the public land surveyor is a breed apart.

Mr. Nelson started at 16 as a surveyor's assistant assigned to examine surveys along the international boundary between Minnesota and Canada in 1904. He and the examiner bought canoes from the Indians for \$5 each, paddled north from Duluth to the limit of open waterways, and from

there on skis and toboggans. Working all winter in weather that hit as low as 50 below, they subsisted almost entirely on moose meat.

The territory was alive with wild game—and also wolves.

"That's the only animal I was ever afraid of," Mr. Nelson declared. "They ran in packs of a hundred or more and we often came across their handiwork—moose and deer pulled down in their tracks and stripped to the bone."

On one snowshoe foray he found himself the quarry of such a pack. Blood-chilling howls tipped off their presence far ahead on the trail. The young surveyor stopped and listened. A minute later the killer chorus sounded again—closer.

Alone and armed only with a revolver, the youth took the only out. He turned and ran for camp, a difficult feat on snowshoes. One misstep and the webs would throw him into a tangled heap, easy prey for his pursuers.

"I figure I set a new record for the mile that day," he grinned.

In 1908 he was assigned to surveys in Nevada and Utah and has maintained residence in Utah ever since.

The Government abandoned its contract system in 1910 and gave Mr. Nelson a temporary appointment in its own corps of surveyors. He married the former Birdie Morrison, member of a pioneer Cache Valley family in 1916 and she accompanied him on many survey trips until raising their three daughters and a son became a full-time job.

Completing a civil service examination in 1917, Mr. Nelson received permanent Federal appointment as a cadastral engineer. His profession has taken him into Arizona, Colorado, Nevada, California, Idaho, Washington, Montana, Wyoming, North Dakota, Minnesota, Kansas, and Utah. It has provided land descriptions necessary for homesteading, mineral development, agricultural operations, reclamation projects, Indian land allotment and, more recently, the identification of school sections in Utah.

In charge of a third of the field force working in Utah in 1954, he accounted for half the area of school sections surveyed. In 1955, with a fourth of the manpower, he surveyed a third of the area

covered. In all his work he has established a record for the lowest cost per mile of surveys as well as the greatest output of work.

"There aren't many of the old timers left," Mr. Nelson commented. "And it's hard to attract younger fellows to field work that's rough, with wages comparatively low."

As an example of how tough it is, just stand on the rim of Bryce Canyon some day and look out over that jumbled mass of sandstone spires. Now simply follow your nose, like a surveyor does his transit, and mark off that vertical nightmare in exact 640-acre sections, burying a post at each corner. Impossible?

Okeh, then try Zion Canyon area where a wrong step can be a thousand feet long—straight down. Measure and post a plateau sliced by scores of chasms. Too dangerous?

Mr. Nelson surveyed both areas.

The last few years he has led his crews into the badlands of southern Utah, including San Rafael Swell and Grand View Mesa. The view may be "grand" but the traveling is tortuous.

It's a vast, rocky plateau scored by countless crevices and canyons varying from the width of a man's body to full-fledged gorges. Sunscorched and treacherous, it's a wasteland attractive only to madmen with Geiger counters.

When Mr. Nelson's transit and measuring chain bring his crew to the lip of a vertical chasm, they either find a way around it or go down one cliff and up the other with the aid of ropes, whichever is easier. Then, computing the distance from rim to rim by triangulation, they continue their straight-line course.

Mr. Nelson cited an instance of terrain trouble:

"Once our camp was only 6 miles from the work site as the crow flies but, because of intervening canyons, we had to travel more than 100 miles by truck and afoot to get there."

There's also a lot of space between water holes in that country. In fact, Mr. Nelson and his crews have had nothing but dry camps for 5 years, their only water carried in containers and carefully rationed.

"Frequently we go 10 or 12 days without even washing our faces," he pointed out. "But thirst is always the biggest problem. I've seen men so weak from lack of water they couldn't lift a shovel-ful of dirt, let alone dig a post hole."

"I've had my tongue swell until I couldn't talk. It completely filled my mouth," he went on. "Sucking pebbles or the inside bark of cedar helps to stave off thirst. But when your tongue starts to balloon, it's time to quit and head for camp."

While surveying the Great Salt Lake desert between Knolls and Wendover in 1926 he made the most interesting discovery of his career. Looking through his transit, about 10 miles north of the present highway, he saw what looked like the top half of a wagon wheel. Investigating, he found the remains of three wagons half buried in the preserving brine with the exposed parts salt-



ANDREW NELSON. This hardy cadastral engineer has been surveying public lands for more than half a century.

encrusted. They had become mired and were abandoned by the Donner party in 1846, then on its way to a rendezvous with death in the High Sierras.

Wheel tracks left by the ill-fated wagon train were still plainly visible in the alkaline desert floor, parallel white lines heading west. Over the years, saline water had flowed into the ruts and evaporated, filling the depressions with pure white salt in contrast to the darker grey of the surrounding desert floor.

"And they're still there for anyone who wants to see them," Mr. Nelson said. Also buried in front of each wagon he found the bones of oxen, abandoned with the wagons and still in their traces.

He had come across samples of desert preservation before. On the same assignment in 1926 he had to tie his survey into an area to the north surveyed 26 years earlier. His task was to find the posts planted by that crew at the turn of the century.

It turned out to be ridiculously simple. Working north he spotted the footprints of the five-man crew heading from east to west, their tracks

(Continued on page 15)

WINGS AGAINST HALOGETON

(Continued from page 11)

all on one sample plot and were undoubtedly young new plants that had germinated several days after the chemical had been applied.

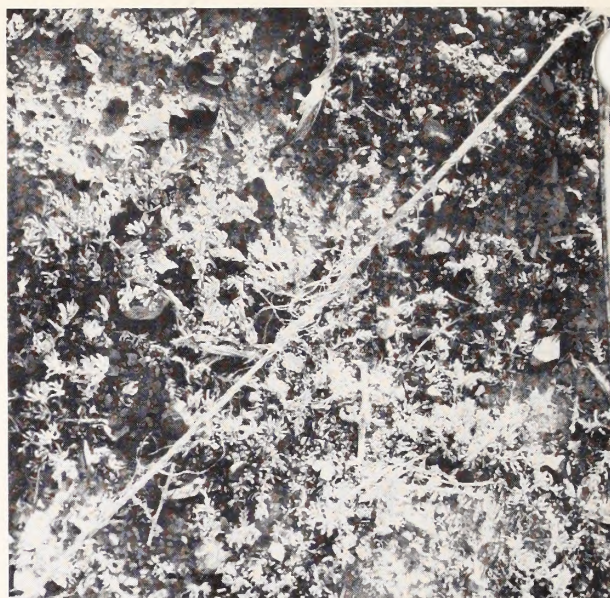
Oil carrier treatment (Formula No. 3). Before—Total live halogeton—all stations—3 transects=1,351. After—Total live halogeton plants all stations—3 transects=476. The number of plants found following this treatment is somewhat deceiving. While this solution did not seem to give so satisfactory kill as the water-oil emulsion carrier, most of the 476 plants that were counted as being alive were badly injured and it was extremely doubtful as to whether they would produce seed. The complete kill by this formulation was estimated to be over 85 percent. Both formulations containing 2,4-D injured the invading rabbit and sage brush and killed some cactus plants that were in the area. These formulations had no effect on the crested wheat grass and native grass species.

Idaho. Readings were made in all the 10 sample plots and for some unexplainable reason the herbicide did not produce satisfactory kills in the initial treatment. The average kill for all sample plot areas amounted to only a little more than 50 percent. Due to the poor results in the initial aerial spraying in Idaho, a second treatment was applied by contract approximately three weeks later. In the second treatment diesel oil was added to the formulations and a very satisfactory kill of all the remaining halogeton plants was obtained. One possible explanation of the difference in effect between the treatment in Idaho compared to Nevada may be that it seemed to be impossible to obtain the uniform spray pattern in Idaho trials that was obtained in Nevada. There also is a possibility that some of the herbicide volatilized more quickly in Idaho due to higher temperatures.

The Nevada treatments cost \$1,240, broken down as follows: 2,4-D—120 gallons, \$315.60; diesel oil, \$191.75; airplane (3 days), \$33; pilot (3 days), \$73.68; per diem for pilot (3 days), \$24; vehicle operation, \$157.89; labor, \$352.08; per diem for labor, \$93; a per-acre cost for 300 acres treated of \$4.13.

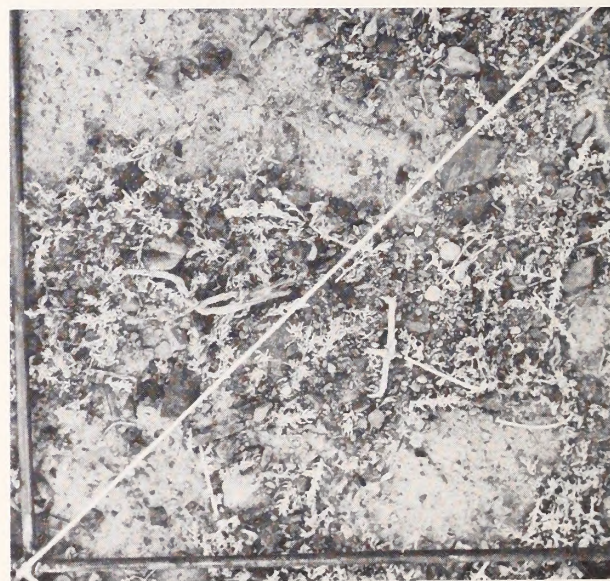
Costs per acre for treating the comparatively small experimental areas would naturally run higher than if aerial spraying were done on a larger scale. Cost of moving equipment and in preparing for spraying operations would run about as high for 300 acres as if a larger acreage of several thousand acres were sprayed.

In analyzing the Idaho costs, charges for the Agricultural Research Service plane and operator were not available so that the average spraying per acre only amounted to \$3. The second application which was done by contract amounted to \$4 per acre for labor, materials, and equipment and \$1.67 per acre for flying costs or a total of \$5.67 for the entire operation.



BEFORE AERIAL SPRAYING. This is how a test plot of halogeton-infested land looked before aerial spraying.

AFTER AERIAL SPRAYING. This is how the test plot looked after aerial spraying.



The initial tests in Nevada and Idaho tend to indicate that chemical control of halogeton with presently recommended chemicals should be restricted to isolated spot infestations where complete kills, with resultant eradication, are feasible. In addition, it appears that it may be practical to treat other areas to prevent seed production and slow down the rate of halogeton spread.

Additional studies are needed to determine the best formulations and rate of aerial application.

Some tentative conclusions were reached. It appears that herbicides can be effectively applied to halogeton by aircraft.

Certain 2,4-D formulations were effective against halogeton under experiments in Nevada.

Aerial application of herbicides to halogeton may be feasible where large blocks of land are involved or along rights of way infestations that extend for considerable distances.

Aerial spraying may be the only feasible method of applying herbicides to halogeton in large isolated spot infestations that are too rough for ground rig applications.

It appears that aerial spraying will not give complete elimination of halogeton but may be the most practical method of applying one or more of the early season treatments to large isolated infestations where followup treatments can be made by ground rigs to kill all plants not completely killed by aerial treatment.

District Range Manager Delbert Fallon and Range Conservationist Dean Sacks of the Elko BLM office and Dick Holland of the Nevada State Office planned and conducted the trials in Nevada. In Idaho, Range Manager George R. Nettleton and Range Conservationist Harold Elg of the BLM office at Idaho Falls were in charge. O. P. DeJulio of the BLM Area 2 office and E. J. Palmer of the Washington office assisted.

In addition to the cooperation from the Agricultural Research Service, personnel from the University of Nevada and Idaho and the Nevada State Department of Agriculture helped with the trials. In Idaho the State Highway Department and the Atomic Energy Commission were extremely cooperative. In Idaho the highway was used for plane landing and takeoff and state highway officials were especially patient and cooperative in controlling and routing traffic.

The Agricultural Research Service furnished the pilot and airplane complete with spray equipment with the BLM supplying all necessary ground equipment, labor, and chemicals. **End**

TRAIL OF THE TRANSIT

Continued from page 13)

clearly defined and preserved in salt for almost 3 decades. He merely followed them to the post markers.

A career spent in fighting nature appears to have toughened rather than weakened Mr. Nelson.

Now 68 years old, he is still a lean, 135-pound bundle of energy with only a hint of white in his black hair, his modest manner and deliberate speech typical of the outdoor type, his skin burnished by wind and rain into a tan as permanent as a tattoo.

He has no thought of retiring. There are still 10 million acres of unsurveyed land in Utah and it's a challenge. He'll undoubtedly tackle some more of it this year with a vigor that belies his age.

As one of his young crewmen of last year remarked:

He sets a mighty fast pace. There aren't many who can keep up with him." **End**

ROBERT S. HALLIDAY's story on Andrew Nelson, cadastral engineer, is in a way not only a tribute to the man himself, but to a breed of men—the public land surveyors.

History applauds the hardy homesteader, vanguard of our western migration, staking and clinging to his little farm claim in the wilderness. But historians forgot the man who led the way—the surveyor.

Homesteaders established their claims on the basis of half buried posts or chiseled rocks marking off the new territory in a grid of mile-square sections and 6-mile square townships, the corners of which were set by men who traveled ahead with a transit over one shoulder and a rifle over the other.

And Andrew Nelson's story brings back a flood of memories to this corner, for yours truly (Roy Hudson, Editor, magazine section, Salt Lake Tribune) spent two summers during his college days working on cadastral survey crews up in the wilds of Wyoming.

Well do we remember our first day on the job. One of a motley crew of college boys and men, gathered from various sections of the country, and in various types of dude or western attire, we scrambled up hills and down valleys on the heels of our engineer, Arthur Brown.

At the close of the day we were so bushed we could hardly stay awake for chow, tumbling into our blankets as soon as possible.

We toughened up in a hurry, but despite our youth and athletic pride, the first one up and ready to go after a break on the trail was the guy with the transit on his shoulder—the man who was putting his gridiron brand on the wilderness.

End

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MINERAL LEASING RECEIPTS FROM OUTER CONTINENTAL SHELF SUBMERGED LANDS

<i>Items</i>	<i>Lease sale Oct. 13, 1954 (Louisiana)</i>	<i>Lease Sale Nov. 9, 1954 (Texas)</i>	<i>Lease sale Jul. 12, 1955 (Louisiana and Texas)</i>	<i>Totals</i>
Bonus bids, oil and gas.....	\$116, 378, 476. 00	\$23, 357, 029. 48	\$108, 528, 724. 53	\$248, 264, 230. 01
Bonus bids, sulfur.....	\$1, 233, 500. 00	0	0	\$1, 233, 500. 00
Total bonus bids.....	\$117, 611, 976. 00	\$23, 357, 029. 48	\$108, 528, 724. 53	\$249, 497, 730. 01
First-year rentals (O&G&Sulfur)*.....	\$1, 234, 175. 00	\$201, 450. 00	\$1, 207, 722. 00	\$2, 643, 347. 00
Total monies received.....	\$118, 846, 151. 00	\$23, 558, 479. 48	\$109, 736, 446. 53	\$252, 141, 077. 01
Number of oil, gas leases.....	90	19	121	230
Number of sulfur leases.....	5	0	0	5
Total number of leases.....	95	19	121	235
Oil, gas acreage leased.....	394, 721. 16	67, 148. 70	402, 567. 00	864, 436. 86
Sulfur acreage leased.....	25, 000	0	0	25, 000
Total acreage leased.....	419, 721. 16	67, 148. 70	402, 567. 00	889, 436. 86
Average oil and gas bonus bid per acre.....	\$294. 84	\$347. 84	\$269. 59	\$287. 19
Average oil and gas bonus bid per lease.....	\$1, 293, 094. 17	\$1, 229, 317. 34	\$896, 931. 60	\$1, 079, 409. 69
Average sulfur bid per acre.....	\$49. 34	0	0	\$49. 34
Average sulfur bonus per lease.....	\$246, 700. 00	0	0	\$246, 700. 00

*After the first year, annual rentals and royalty payments are made through the Oil and Gas Supervisor of the Geological Survey.

BONANZA. The fourth lease offering of the U. S. Department of the Interior, planned by the Bureau of Land Management for May 15, 1956, could boost earnings from oil, gas, and sulfur development in the Gulf of Mexico's Outer Continental Shelf well on the way toward the half billion dollar mark. The summary of bonus bids and first year rentals for the first three lease sales showed slightly more than a quarter billion dollars in the till, (U. S. Treasury), prior to the fourth sale. This did not include \$1,435,618 in second year rentals received by the Geological Survey from the 461,870 acres embraced in the 109 oil and gas leases, and from 25,000 acres in the five sulfur leases issued in 1954. Besides the new receipts to be added when execution of the fourth sale leases is completed, still more revenues will be forthcoming from royalties on production and future rentals. The production royalty is 16 2/3 percent of the value of all oil and gas produced and 5 percent of the gross value of sulfur produced. Rentals are \$3 per acre, on oil and gas acreage, and \$2 per acre on sulfur acreage. As of April 1, 1956, four discoveries had been reported under leases issued by the BLM.